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(54) MANDREL HEAD FOR PRESSING OF PATCHES DURING CASING REPAIRS

The invention relates to devices for the repair of casings of water, oil, and gas wells in order to restore hermetic tightness or strengthen casing walls by means of a longitudinally corrugated metal pipe.

A mandrel head for pressing of patches during casing repairs is known which comprises a rigid cone swage, a flexible sector-type head, and a mechanism for switching the head from the transport position to the working position [1].

A shortcoming of the aforementioned mandrel head is the inability to perform high-quality pressing of patches in a pipe under repair that has deviations in shape and cross-sectional dimensions.

Of known solutions, the most similar one is a mandrel head for pressing patches during casing repairs which includes a rod on which are mounted a rigid cone swage, a sector-type head, and an assembly for switching the head from the transport position to the working position [2].

A shortcoming of the aforementioned mandrel head is that it does not ensure reliable operation in pipes of different diameters.

The object of this invention is to ensure operational reliability of the mandrel head in pipes of different diameters.

The stated object is attained by virtue of the fact that it is equipped with movable expanding sectors mounted on a rigid cone swage, and with spring-loaded conical slides mounted on the rod so that the top ends of the sectors of the sector-type head are articulated to the rigid cone sage, and the bottom ends are mounted so that they can interact with the slides.

Figure 1 shows the mandrel head in transport position; Fig. 2 shows section A–A of Fig. 1; Fig. 3 shows section B–B in Fig. 1; Fig. 4 presents section C–C in Fig. 1; and Fig. 5 presents the mandrel head in working position.

The mandrel head consists of a rod 1, on which are mounted a rigid cone swage 2, a sector-type head 3, and an assembly for switching the head from the transport position to the working position, which includes a spacing sleeve 4 and a spring 5. Rigid cone swage 2 is mounted on rod 1 so that it can travel along the latter between support cone 6 and spacing sleeve 4. Mounted on rigid cone swage 2 are movable expanding sectors 7, which are equipped with adjusting screws 8.

Mounted on rod 1 are conical slides 9, which are spring-loaded by stacks of disk springs 10. The top ends of sectors 11 of sector-type head 3 are articulated to rigid cone swage 2, and the bottom ends are mounted so that they interact with slides 9. When the device is in the transport position, the patch (a longitudinally corrugated pipe) 12 rests on support cone 6.

The mandrel head works as follows.

The mandrel head is attached by rod 1 to the power package of the device (not shown in the drawing); here, patch 12 rests on support cone 6, and spring 5 restrains the mandrel head in the transport position.

After the device is run to the specified depth and the power package is turned on, the end of patch 12 that has been flared by support cone 6 rests on rigid cone swage 2 and, overcoming the resistance of spring 5, moves swage 2 until it stops in spacing sleeve 4; as a result, sectors 7 move apart to the specified size, and the sectors 11 of the sector-type head 3 rotate through some angle, resting on the beveled surfaces of the corresponding spring-loaded slides 9; here, the height of spacing sleeve 4 is tailored so that the overall diameter on the shaping surface of sectors 11 of sector-type head 3 increases to a greater extent that that of sectors 7 and exceeds the inside diameter of patch 12 after mandreling.

As the mandrel head is pulled farther, the patch is successively flared by punch 2, sectors 7, and finally sectors 11 of sector-type head 3, which elastically press, with the specified force, patch 12 against the walls of the casing pipe being repaired, thereby providing the necessary hermetic seal, which also is aided by the sealant with which the outside surface of patch 12 usually is covered before it is run into the well.

Just before the device is run into the well, the following adjustments are made, depending on the specific conditions (the wall thickness of the pipe being repaired, the wall thickness of the patch being installed):

a) the overall diameter of sectors 7, by means of adjusting screws 8;

b) the amount of reciprocation of sectors 11 of sector-type head 3 by the setting of spacing sleeve 4 of the corresponding height; and

c) the magnitude of the radial forces generated by sectors 11 of sector-type head 3 by the corresponding pulling of disk springs 10.

The mandrel head makes it possible to set a patch in casing pipes with any casing-wall thickness.

The design of the mandrel head allows setting of optimal radial forces on elastic elements in relation to the required degree of deformation, the material and thickness of the patch wall, and the amount of radial travel of the elastic elements with consideration for coverage of possible deviations of the inside diameter of the pipe being repaired, within manufacturing tolerances.

Claims

A mandrel head for pressing of patches during casing repairs, which includes a rod on which are mounted a rigid cone swage, a sector-type head, and an assembly for switching the head from the transport position to the working position, said mandrel head being *distinctive* in that in order to ensure the operational reliability of the mandrel head in pipes of different diameters, it is equipped with movable expanding sectors mounted on the rigid cone swage, and with spring-loaded conical slides mounted on the rod, so that the top ends of the sectors of the sector-type head are articulated to the rigid cone swage and the bottom ends are mounted so that they can interact with the slides.

Information Sources Taken Into Considerationin the Expert Review

1. U.S. Patent No. 3,162,245, classification 166-63, published 1964.
2. U.S. Patent No. 3,179,168, classification 166-14, published 1965 (the prior art).